

EOS, Transactions, American Geophysical Union

AGU (cout. from p. 4471

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sor's name. 3. Curresponding address: Give complete address and phone number of author to whom all correspondence (acknowledgment nral acceptance letters) should be sent. Abbreviate as much as passible. 🖖

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nology); P (Physical Ocennography); S (Acoustical Oceanngraphy); X (Other).

5. Type title of special session (if any) to which submittal is maile. 6. Indicate your preference for a particular kind of presentation by une of the following letters: O, ural; P, poster. The chairman may assign you in either of these types of presentation in order to fit his or her pro-

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Poster Sessions

A large, centrally located meeting room will be set up for poster presentations. Experience from recent ACU meetings and from other scientific societies has shown that a poster presentation, while more demanding of the author, can provide a superb opportunity for comprehensive discussions of re-

If individual papers are tleemed by a prngram chairman to be sititable for this type of presentation, they may be so assigned. Presenters of poster papers are reminifed that a poster exhibit requires careful preparation. Figures and text will be scrutinized in detail, and anthors must be prepared to discuss the contents of their papers in depth. Under these conditions, well-prepared fig-

Program Committee ...

Meeting Cochairmen John R. Apel, Johns-Hopkins University, and Richard T. Barber, Duke University AMS James J. O'Brien, Florida State Uni-

ures and concise, logical text are essential.

ASA Robert S. Winokur, ONR ASLO Mary Jane Perry, University of Washington
Mrs. Ned A. Ostenso, NOAA

13711

Special Sessions

Warm Core Rings Air-Sea Interaction in Coastal Region Shelf Dynamics: CODE Optical Dynamics Experiment Marginal Ive Zone Experiment California Current

Gull of Mexico/Caribbeau: Biological Checcal, and Physical Oceanography -Sunthern Oceans: Dynamics, Biomass

Arctic Ocean: Dynamics, Biology, Acoustic Scallour Spreading Centers El Niñu and Climate Variability El Chichin, Global Climate, Chemistry Oceans and Atmnspheric Chemistry: COL

Na, Freums Ocean Heat Transport: Climate, Paleotima Acoustic Monitoring: Suspended Parlithm

Acoustic Remute Sensing: Fine Structure, le ternal Waves, Mesoscale Features Acoustic Imaging: Seaffoor, Precision thymetry

Acoustic Tomography Large-Scale Ocean Observing Systems SAR Surface Signatures Ocean Tracers Radioactive Disposal Environment and Fisheries Year Class Sur

Zooplankton Beliavior Plankton Growth Rates In Ollgotrophic life

Below Ground Processes in Wedland From Phytoplankton Responses to Fluctualing E vironments Aquatic Nitrogen Cycles

Interrelation of Optical and Blological Prop. Dynamics of Microaggregates in Occanic 5 Organism Growth and Behavior in a Turb

Biology and Physics of the Bentlic Boundary Laver Feeding Ecology of Fishes Gyanobacteria: What Are They Doing!

lent Fluid

IUGG Quadrennial Report Overview

Solar-Planetary Relationships: Aeronomy 1979-1982

Richard S. Stolarski

NASA/Goddard Space Flight Center, Greenbelt, MD 20771

Aeronomy is the study of the physics and chemistry of the upper atmosphere. The uper atmosphere is usually defined as the region of the atmosphere abuve the tropopause atending upward to the point where electric and magnetic fields dominate the phenomena rather than the atmospheric atoms and molerules. The lower part of this region, from about 10 to 90 kilometers altitude, has beome known as the middle atmosphere. An international program called MAP (Middle Amosphere Program) is now underway to inlensively study this region. Three reviews of work in the middle atmosphere appear in this volume covering the composition, dynamics, and electrodynamics. Susan Solomon's paper, "Minor Constituents in the Stratosphere and Mesosphere," documents the continued growth in knowledge concerning the compo-stion of die middle atmosphere, the mechanums which maintain dris composition, and

its possible response to outside influences. Denuis Hartman's review, "Middle Atmosphere Dynamics," examines the large-scale tlynamics and climatology of the middle atmosphere, particularly pointing out the importance of the introduction of transfirmed Enlerian mean equations for dynamics and transport and the realization of the imporrance of gravity waves for the momentum builget of the stratosphere. Michael Kelley's review, "Middle Atmosphere Electrodynamics," discusses a variety of new techniques that have been used to obtain "existing and con-troversial" results including large (several volt/meter) fair weather electric fields in the

Above the middle atmosphere is the region referred to as the thermosphere or ionosphere, depending on which properties of the region are being emphasized. The review of this region is again divided into several pa-pers. Douglas Torr's "Neutral and Ion Composition of the Thermosphere" summarizes
the continued advances in the understanding of how solar extreme ultraviolet radiation is teracts with and determines the composition and structure of the thermosphere. He emphasizes the significant contributions of the Atmosphere Explorer Satellite series. Raymontl Roble, in "Dynamics of the Earth's Thermosphere," puts his emphasis on questions concerning the global circulation, temperature, and compositional structure of this highly variable region. "lonospheric Electrodynamics and Irregularities" are covered by Arthur Richmond with emphasis on the modeling and data concerning the global electric

circuit. Thus both the middle atmosphere and the thermosphere are described in three reviews emphasizing different aspects of the physics and chemistry of the respective re-A further report, "U.S. Contributions to

Auroral Actinomy, 1979-1982" by M. H. Recs, is devoted mainly to the special aspects of the thermosphere which are initiated in the auroral region by particle precipitation. Finally, the "Aeronomy of the luner Planets" by Toin Cravens and Andrew Nagy covers the recent advances in understanding of the thermospheres of Mars and Venus, providing a summary of the recent Pioneer Venus 1e-

Conteats: IUGG Quadrennial Report Salar-Planetary Relationships: Aeronomy

U.S. Report to the TUGG, 1979-1982; Solar-Planetary Relationships: Aeronomy, R. S.

Dynamics of the Earth's Thermosphere, R, G. lonospheric Electrodynamics and Irregularities: A Review of Contributions by U.S.

Scientists From 1970 to 1982, A. D. Rich-

U.S. Contributions to Auroral Aeronamy, 1979-1982, M. H. Recs

Neutral and Ion Composition of the Thermo sphere, D. G. Tour Acronomy of the Inner Planets, T. E. Growno

aul A. F. Nagy Middle Atmospheric Electrodynamics, M. C.

U.S. National Report to IUGG 1979–1982

For is periodically publishing the 12 overviews appearing in the U.S. National Report to the International Union of Geodesy and Geophysics 1979–1982. The U.S. National Report is being published by AGU on behalf of the U.S. National Commission of Regions of Commission Committee in four extra usues of Review of Geo physics and Space Physics (RCSP). The discipline overview appearing here was published with its associated papers (see Contents list at the end of he overview) in volume 21, mumber 3, March 1983 of RGSP.

Subscribers to RGSP will automatically receive Substructs to RGSP will almost an receive the four extra RGSP issues containing the U.S. National Report. All four extra issues will have been mailed by July 1983. The four regular is-sues of RGSP are appearing as usual in Febroary, May, August, and November. Those who do not subscribe to RGSP can still obtain the entire U.S. National Report by entering a subscrip-tion to RGSP. In addition, the report of each discipline will automatically be mailed separately those members of AGU for whom that din ipline is their joinnary AGU section allillation; this separate distribution is made possible by grams from the Defense Mapping Agency, Na-tional Aeronautics and Space Administration. National Oceanic and Atmospheric Administra-tion, National Science Foundation, Othice of Na-

Minor Constituents in the Stratosphere and Mesusphere, S. Sohumu

Middle Annosphere Dynamics, D. L. Hart-

News

Arctic Air Chemistry: Haze Analysis

The microparticulate (i.e., aerosol) and gas concentrations in Arctic air masses are being assessed currently as a result of a large-scale, multinational cooperative struly made this spring. It turns out that many of the itleas about the origin of Arctic haze, industrial pollution, soil particles from the great ilesert regions of eastern China and Mongolia, and ersonal effects, to name a few, may all be ralid. A recent report about the first extended airborne measurements of Arctic haze that were made during March and April of this year stated: "Most of the scientists on bound the NOAA plane found the haze to be much denser and more extensive than they anticipaled" (Emiron. Sci. Technol., June 1983]. be results of WP-30 Orinn research aircraft lights over the Arctic ice cap auggest that in one locations the haze extends upward of 15 km at this time of the year. The haze was found to exist at all intitudes in the northern polar region with umbroken continuity to an ditude of approximately 3 km. At higher al-titudes there was a banding of discontinuous

base layers. According to the report, the Arctic haze is subject to climatic and seasonal factors that ate characterized by pollution indicators: primarily, sulfate concentrated at 2 µg/m², or-ganic carbon concentrated at 1 µg/m², and black carbon (soot) concentrated at 0.3-0.5 18/m1. Of these, the soot particles are the mly ones created by combustion processes. lesert soil-derived aerosols can be distinguished from pollutants by their aluminum toncentrations (pollutants are relatively alu-minum free) and by their vanadium-alumium ratios. Evidently, vanadium is richer in pollutants derived from the burning of heavier, lest expensive oil fuels (too viscous to be orned conveniently at Arctic air temperalunes). The vanadium-aluminum ratios of such pollutants can be I or more orders of magnitude higher than those characteristic of

anguluoc nigner than blood and all soliderived aerosols.

The NOAA flights took off from Anchorage, Alaska; Thule, Greenland; and Bodø, Norway: they concentrated their routes with-in 70°-90°N latitude, which passed some of hem over the North Pole. A University of Washington plane took off from Point Bar-row, Alaska, and German and Norweginn planes departed from Spitzbergen, Norway. Thirteen university groups were involved in the joint effort with CIRES (Cooperative Inshule for Research in Environmental Scibesides NOAA (National Ocean and Atmospheric Administration) were: NCAR (Na-sonal Center for Atmospheric Research), NASA (National Aeronautics and Space Ad-ministration) ministration), DOE (Department of Energy), MAR (Norwegian Iustitute for Arcule Re-karch), and AES (Canadian Atmospheric ironment Service). Thus the study liad an unusually large number of groups involved,

and it generated large numbers and types of air chemistry measurements.

The results of these studies will be present ed at the third Symposium on Arctic Air Chemistry, to be held in May 1984 at Toron-10. Within the myriad character of Arctic air patterns (chemistry, seasons, and climate) (an be found the pleasant fact that at times of the year-late spring and aumnier-the Arctic is free of pollution and haze; the air is pristine and clear. During that period, aerosols and Hutants are scavenged and the amosphere is clean because of its remoteness from major pollisting sources. By late October, however, he Arctic air dries, and air masses containing the emissions from industrial sources far away are transported slowly over the north-ern polar region.—PMB

Lost Island Found

An abandoned 11-by-5-km kidney-shaped cliunk of freshwater ire, used as a research station for 25 years, was rediscovered after the National Ocennic and Atmospheric Administration (NOAA) lost track of the island for 6 months. The recent find may foreshad ow another loss, however: The island is drift-ing through the Greenland Sea and into the North Atlantic where it should melt within several months and dump its cargo of oil drums, equipment, and a wrecked plane into

the ocean. Known as Fleicher's Ice Island-after Joseph O. Fletcher, a member of the first team of researchers to inhabit the island and a recently retired NOAA climate researcher—the ice chunk has already melted to a durd of its original 49 m thickness. A pilot flying over the area to measure annual pollution buildup in the Arctic located the drifting island 242 km from the North Pole near the International Date Line.

Identified by Fletcher as a fragment of the Ellesmere Island ice shelf, the island was the home for a number of Air Force, Navy, and NOAA scientific teams that provided weather reports and conducted experiments. Before satellites superceded the research and forecasting functions of the teams on Fletcher Island, the station also was a valuable site for observing oceanic and aumospheric circula-tion. First occupied in 1952, the island was abandoned in the mid 1970s.

In addition to its historical significance to scientific research, the site gained notoriety when a man on the island lost his life in an argument over a bottle of wine.

New Climate Center:

An Experimental Climate Forecast Center has been established at the NASA Goddard Laboratory for Atmospheric Sciences (GLAS) by the National Oceanic and Atmospheric Administration's (NOAA) National Climate Program Office, NASA's Goddard Labora, tory will provide the computing facilities nec-

essary to process the vasi amount of data used in complex numerical climate modeling. As the second of the centers established

under the National Climate Program Act of 1978, the Experimental Climate Forecast Center will investigate climate predictability theory and forecasting techniques by using numerical methods in dynamic models of the earth's occan and atmosphere system. The first temer, at the Scripps Institution of Oceanography, concentrates on statistically based methods. The principal interest of both centers is the potential for forecasting characteristics of seasonal temperature and precipitation. The director of the new center is Milton Halent; he also will continue as head of the global modeling and simulation branch at

NOAA's National Climate Program supports research on improving forecasts of next season's and perhaps next year's weather to aid planning for crop fertilization and irrigation schedules, geographical distribution of heating fuel, and maintenance of urban fresh water supplies.—BTR

NASA FY1984

The White House budget request for the National Aeronautics and Space Administration (NASA) for fiscal year 1984 contains a number of continuing problems for outside investigators in universities and in the private sector. Nonetheless, the budget climate for NASA seems to be improving. (For more information on the budget for FY1984, see Eas, February 15, 1983, p. 55, and May 17, 1983,

p. 378.) Several new program starts are responsible for the feeling of optimism being sensed in many sectors of the scientific community. These include the Venus Radar Mapper, a shuttle-tethered satellite to study the earth's upper atmosphere (the tether could be 100 km in length), and the EUVE experiment

(Extreme Ultraviolet Explorer).

The problems that remain in the budget are unfortunately rather focused on the geophysics academic community. For examp research and analysis funds are reduced in the FY1984 request to about what they were in the FY1983 request because Congress restored the fitnds cut last year. This year, the batde is going ou again in both Houses, and at this point it appears as through the cut funds may be replaced again, particularly if Congress is supported by the scientific com-

nunity as it was last year. In FY1983, the research and analysis appropriation was \$50.3 million. This fiscal year it is down to \$45.5 million, but by mid-August the new appropriation may restore the gust the new appropriation may restore the cut. The budget request overall is set by the Office of Budget and Management at \$7.106 billion, which is an increase of \$.75%.

The space science portion of NASA's budget has been boosted significantly for FY 1984 about 14%. The Gamma Ray Observatory s back on a schedule with a launch date of 1988. The Venus Radar Mapper will fly also in 1988; to be launched by using the shuttle-Centaur appearage. The Galileo mission is to

be launched by Cemann in 1986 and will arrive at Jupiter in 1988. NASA will not send its half of the two-sar-

ellire experiment in the 3986 langel of the International Solar Polar mission. Finals are being aimed at supporting the remaining sin-gle spacecraft of the European Space Agen-cy.—PMB

Hess Centennial

June 24 marked the 100th birthday of Victor F. Hess, the discoverer of cosmic radiation. The Austrian-born scientist received the Nobel Prize in physics in 1936 with Carl Anderson of the California Institute of Technology, who discovered the positron. When he died in 1964, Hess had more than 150 atti-

cles and publications to his credit.
In 1910, while a lecturer at the University of Vienna, Hess launched an unusual series of experiments to measure the conductivity of air. He made 10 balloon ascents, half of these at night. On the basis of these experiments, he concluded that "radiation of very high penetrating power enters our atmosphere from above." One ascent made during a solar eclipse proved that the sun could not be the main source of cosmic rays.

Hess made his first trip to the United States in 1921. Under hu supervision, a research laboratory, the United States Radium Corporation, was built in New Jersey; he served for 2 years as the corporation's director and chief physicist.

Hess then returned to Austria to the University of Graz, where he later became dean of the faculty. He accepted a position at the University of Innsbruck in 1981 and established a laboratory for the observation of cosmic radiation there. Six years later he returned to Graz, In 1938, after Hitler's Germany annexed Austria, Hess fled with his wife, who was Jewish, to Switzerland. While in Genera, Hess was offered a full professorship by Furdicam University. He accepted and moved back to the United States, Hess



Victor F. Hess

The VGP News



Editorr Brose Doe, 11721 Dry River Court, Res-ton, VA 22091 (telephone 703-860-8470, after 5:30

Sigurdur **Thorarinsson** 1911-1983



In March 1875 a miniber of farms were abandoned in eastern lecland as a consequence of the great eruption of Askja volcaa. The abandonment of one larm, however had to he delayed as the family was expecting a child. In the spring a son was horn. He was Thorarinn, the father of Sigurdur Thorarinsson. This incident is merely one example of the dynamic interaction between man and nature which is so typical of Iceland. Here the geological mill, fueled by vigorous volcanism, glatiers, and swift rivers, grinds faster than elsewhere nn earth. Here the existence uf a small nation is continually responding and adjusting to the environmental pressures gencrated by rapid and sometimes catastrophic

Signedur Thorarinsson died in Reykjavik on February 9, 1983, at the age ni 71, following a brief illness. Born an January 8, 1912, he was the leading teelandic earth scientist of the 20th century and acquired international renown for his research in vulcannlogy. The list of accomplishments of this remarkably versatile man is indeed impressive. He pioneered the development of tephrochromology as a branch of earth science, first as a tool in archeulngical research and later as a key in the volcattic blands of Iceland. The fruits of this research included a monograph on the eruptions of Hekla in historical times and led tu the important discovery of a regular relationship between the length of repose period and the silica content of Hekla's magnias.

Sigurdar witnessed or studied all volcanic eruptions in Ireland since 1934. Probably un nther scientist has accumulated comparable lield experience on active valcances. His accunnts of the birth and growth of the volcanic island of Surtsey are classics in volcanningical research and claritied nur understanding uf the role of seawater in hyaloclastite formation, the characteristics of base storge activity, and the evolution of table mountains. He immediately embraced the concepts of plate tectonics and applied them to interpretation of the structure of iceland as early as 1965. He also made important advances in glaciology and contributed to the understand relationship between geothermal activity in subglacial volcanoes and periodle jokulhlaups or glacier-bursts. His works in the lickle of orphology and soil erosion further emhasize the breadth of his interests.

Signrefur maintained a remarkable produc tivity through the years, and published well over 200 papers and books. At the time of his death Sigurdur was preparing manuscripts on the 1783 fissure emption of the Laki crater-row and its atmospheric effects on the northern hemisphere. Other works in progress included the volcanic history of Iceland and the lang-awaited Iceland volume of the Catalogue of Active Valcanues of the World. These compilations represent a life-time lafor of love but were continually being update ed to include new research and new emptions. It is hoped these works will be pub-

Significant Thornrinsson studied in the University of Copenhagen and the University of Stockholm, where he completed a classic floctoral dissertation in 1944 on the tephrocuronology of Iceland. He returned to Iceland and became director of the Geology Department of the Museum of Natural History in 1947 and the first professor of Geology in the University of Iceland in 1968.

Another side of Signrdur's personality, not generally known to his foreign colleagues, was his work as a poet and songwriter. He wrote hundreds of witty poems, which have become part of the Icelandic folksong tradition. His poetry, gond humor, and inexhaust-ible energy in informing the general public about geological processes made him lee-land's favorite son. Signrdur was never a controversial ligure; his immovative research was always solid and has stood well the test of time. He was fair and unsellish and generonsly shared his ideas with colleagues, who always held him in highest regard. His death is a great loss to the science of volcanology.

This tribute was pratten by Haraldur Signedsson of the Graduate School of Oceanography, University of Rhode Island, Kingston, RI 02881.

Welcome to The VGP News

Scope of the Section

Beginning with this issue of Em, the Volcanology, Geochemistry, and Petrobagy Section of AGU will publish brief and timely scientific reports, highlights of conferences, statements of opinion, section news, and other topical information approximately every 1 manths in a new section of Eos called "The VGP News."

Material for The VGP News will be handled by Eos Editor Bruce R. Doe. VGP Section President J. V. Smith has appointed the following editorial group to work with Due:

Peter W. Lipman, VGP Secretary, U.S. Geological Survey, MS 913, Federal Center, Denver, CO 80225 (telephone: 303-234-2901) Charles A. Wood, SN4-NASA Johnson

Space Center, Houston, TX 77058 (telephone: 713-483-38161 William P. Leeman, Department of Geobgy, Rice University, Housion, TX 77001 (tele-

phone: 713-527-4880) Joseph R. Smith, 156 Piedra Loop, Los Alamos, NM 87544 (telephone: 505-672-

> Peter W. Lipman Secretary, 1'GP

VGP Opportunities

It is a great pleasure to introduce this first edition of The VGP News. I have enjoyed greatly the reports from the Oceanography section and was delighted to find that Brent Dalrymple and Peter Lipman were equally enthusiastic for starting a VGP equivalent Chuck Wood has provided a very useful service with his Vnlcano News, and he plus Bill ceman and Joe Smyth have the enthusiasm and general knowledge to put together valuable news items. But they will need the help uf uther metabers of the section in their

Our section faces major problems in capi-talizing on the remarkable growth of knowledge and techniques. We need to integrate the laboratory and held aspects of our sciences. The new techniques, such as high-energy mass spectrometry and synchrotron-

based experiments, will put further pressure on funding.

Our section could provide a useful public service by providing reliable information on geological hazards along with advice on the consequences of various social and political choices. We could also illiscuss the problems of the fractionation of the earth sciences into so many subgroups and possible ways of providing increased cooperation between them

(e.g., the various geochemical-based societies).
On behalf of the whole section, 1 wish the editors and secretary all the best in this ventitre and thank them for their labors.

Joseph V. Smille

President, VGP

News & Announcements

New Crater in Costa Rica

On April 9, 1983, we discovered a new explosion crater buried in the thick rain burest that covers the Hanks of Arenal volcano in Costa Rica.

The previously undetected crater, which we named Crater 1, is located between the twin volcanic system Arenal-Chatn at 81°41'53"W and 10°27'42"N (Figure 1), It resulted from a phreatic explosion occurring probably during the 1968 explosive phase, in which three other well-known main craters 1A, B, and C) were opened along a fracture on the western side of the Arenal Vulcano. Crater f has furmed at the physical discontiunity that existed at the boundary of Arenal's

lava-armon that was created during the A Fault empation evely. The explasion, a mail directed likest seriouted 115° from the soil orginated at a depth of approximately heaving a circular ceater 25 m wide and h deep with on axis shiping 15° from the notation. I have called the craner is made up of nonjuent lava blacks and lapilli and is now covering. thick ferns.

Crater | substantiates the existence of therp, SE-NW-trending fracture systems which the twin volcames have collect gives important parameters to locating to zones of weakness in which future caping activity may take place.

This news them was contributed by Andreas. gia. Centra de l'overtignemes Geofbica, Che dust de Costr Rien, Cindud Universitaria Res Facto," Conte Hied, and Clark Poore, ACM gium, Definitional of Geology, Beloit College, buil, 111 57511.

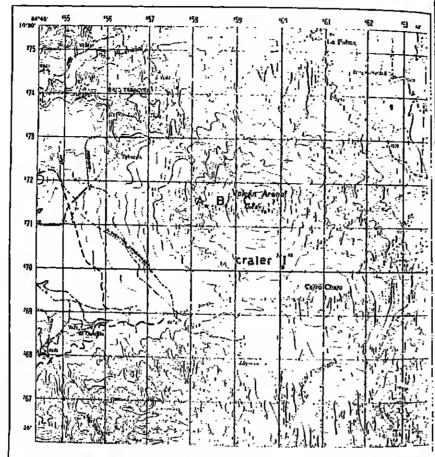


Fig. 1. Topographic map of Arenal-Charo twin volcanic system showing the locations Crater I. Craters A, B, and C, formed during 1968 explosive phase, are also shown Map from the Institute Geografico Nacional, San José, Costa Rica, Scale 1:50,000.

Irvine Receives VGP Award



T. N. Irvine

Textbooks of not so long ago typically pre-sented the study of stratiform igneous intrusions as a simple and straightforward exercise in nature's petrology laboratory. The fractional crystallization products of mafic magms were presumed to accumulate sequential ly, largely in response to gravity. Those famil-iar with the literature of the past several years are aware, however, that the textbonks of the next generation will conclude that this model, if not actually wrong, is at best a gross oversimplification. Why this apparent fall from grace of such a seemingly useful con-

One reason is that the number of geologists willing and able to visit the cold and lonely places where such bodies in the northern hemisphere invariably occur has grown. Consequently, the amount of geological informa-tion on the structure and composition of such bodies also has grown. But merely increasing the size of a cottage industry need not neces-sarily alter the nature of its product. So too the new directions in the study of Jayered in-trusions are the result of far more than just a

growth in the amount of available data liare primarily the result of a few creative po ple seizing new observations, combining with theory and experiment, and offering new insights into the meaning of these obe

The propient of the 1982 VGP Arad 1 N. Irvine, is a prominent example of subperson, and he is specifically honored for studies of the Muskox Intrusion in nother ern Caunda. An appreciation of the work has done there and the insights recovered from his studies may be gutten from hisp per in the volume on Physics of Magadal cover [R. B. Hargenves, Ed., Princeton University of the Princeton Univers Pross, 1980). But any one of a number of earlier papers on geological observations. ory, and laboratory experiments relating to the evolution of layered intrusions would he illuminating in this regard. It is difficult avoid the suspicion that Irvine has a seed phone broth into which he steps to shed be mild-mannered exterior before wring pe pers of such intellectual force.

So what has Irvine done to dear our well with regard to the meaning of layered init sions. In general terms he has provided p snasive evidence that much more thank ion and gravitational crystal scaling and in the Muskox and other intrusions. portance of repeated injections of magna-into a fractionating chamber, the months of country rock, the mixing of fresh fresh ated, and contaminated magniss, the pere-tion of intercumulus liquids, the action of turbidity currents, and the operation of deble-diffusive convection have all been reof nized through Irvine's careful work all though, as a consequence, layered introduction no longer be viewed as the result of its ple crystal fractionation and setting her have actually become much more interest, petrological showspass for a rich variety of petrological showcases for a rich variety neous processes. For Neil Irvine's conti tions to this intportant and fundamental transformation in petrologic thinking 125 pleased to present him with the 1882 VGP. Joseph V. Som

Volcanology, Geochemistry, and Petrology See

Accebiance

I am most plensed to be honored within award and to know that my work of later Introsions is appreciated to such an exten-This work has been going on now form

than 25 years, so I presume that a considerable cumulative effect is reflected here. Over ach a long time, one benefits through associations with many people, and I will take this occasion to mention those who have helped

My list has a strong Canadian Have, and it begins with Bruce Wilson at the University of lanitoba, where I was an undergraduate. When I think back. I realize that my career was practically determined by two or three of his lectures in which he described some of his own very perceptive work on layered intrusions and their ore deposits. Those lectures auracied my interest in the rocks that have since become my principal research subjects. Bruce also directed me to Caltech, which was the next step on my way.

Shortly after 1 arrived at Caltech, I learned

that Jim Noble, whn was then Professor of nomic Geology, had charge of a project in which he hired students to work on nitramafir rocks in southeastern Alaska. This apealed to the interest that Wilson had raised, when the time came to find a job for the following summer, I sought Jim out. He signed me up to go to Duke Islamil, where, as turned out, we found the world's most beautifully layered ohraniafic rocks. From that time on I was hooked! Most people who mow somheastern Alaska strudder at all the rainy weather, and Duke Island uself is a ather swampy place. But to me at the time, it azs the most exciting place on earth: I literalh thrilled at the mapping that unravelled complicated layering structures, multiple inions, and magniatic replacement bodies. During this work and through to its publication some years later, Jim Noble gave me patient support and encouragement, and I am greatly indebted to him.

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Cover. A view of the 2.3-km-diameter Akutan Volcano caldera of Akutan Island Alentian Islands. Such a view, looking outh on January 16, 1983, is rare owing to the normally poor Alentian weather onditions. Note the recent ash fall on the mow just to the left of the steaming, cinler-dominated cone. A small ash eruption occurred from this cone in December 1982. In September 1978, a fairly large ash eruption occurred in which andesitic lavas flowed from the base of the steoming cone over a large part of the caldera oor, through the northern breach in the taldera wall, and then down the northern slope of the volcano to within 1 km of the coast. During recent investigations, organ-ic soils were found directly beneath parts of the large pyroclastic flow and air-fall deposits that resulted from the calderaforming event. The carbon 14 age determined for this soil (three dates only) suggests that the Akutan caldera may have formed about 5,000 yr B.P. (Photo courte ly of John W. Reeder, State of Alaska Division of Geological and Geophysical Surveys, Anchorage, AK 99510.) Gerhard von Genenewahlt, who arranged a rulating 3-month visit for me to the Bush vehl Complex; and last but not least, my wife, Lorna, whose wisdom and spirit have heen major factors in my career and who, together with our children, Mirhael and Kerri, gives my life its balance.

I have had many pleasures in working with layered intrusions, but I will admin also to the feeling that with all my opportunities 1 should have accomplished more. This award is very much a reminder in that respect as well, him if it helps to keep me going (as it should), then it will be all the more in my good. Thank you very much.

Meetings

After graduation I worked for a summer

with the Geological Survey of Canada on a

helicopter survey in the Northwest Terri-

mapped an area of approximately 60,000

virtually unknown and in part because I

square miles. This was a marvelous experi-

ence in itself, in part because the country was

made a transition from mapping at 50 feet to the inch at some places on Duke Island to

cupter. There is nothing quite like that in broaden one's horizons! The more immediate

mapping at 8 miles to the inch from a heli-

significance of the survey, however, is that

the area included a large, layered intrusion

that had only just been discovered. That body is now called the Muskox Intrusion. I saw

Muskox only briefly that summer, but I was

impressed that it was totally different from

the Duke Island rocks, yet every bit as in-

trigning. I was delighted, therefore, several

years later when the opportunity came for

When I joined the Muskox project at the Geological Survey in Onawa, Charlie Smith

was leader, and Chris Findlay, though still a

produced a map of the intrusion that ranks

with the best of its kind, and he and Chris

out a major drilling program to obtain con-

tinnous samples. Charlie, Chris, and many

others who contributed, have long ago gone

on tu other endeavors. I am very much their

beneficiary, and whatever success I have had

with Muskox is largely owing to their excel-

Since I moved to the Geophysical Labora-

tory, I have continued to work on Muskox,

but my director, Hatten Yorler, has made it

possible for me to also explore many other

Montana; and Bushvebl in South Africa; I

have visited Rhum in Scotland and the Du-

water have been receiving most of my atten-

tion. At Skaergaard, I've gone back node-

tailed mapping to document lavering strin-

scenery and exciting trips. My thanks here go

to Alexander McBirney. Mac encouraged mr

more than anyone he opened my eves to the

potential importance of double-diffusive our-

palladium ore zone. This study, which has hel-

deeply into double-diffusive convection and

magnia mixing, has been done in collabora-

grateful to them and their employers for the

Dick Jahns, who taught me useful mapping

stein, who impressed me with the value of ap-

methods; Gerry Wasserburg and Sam Ep-

plying physics and chemistry to geological

problems; Hugh Taylor, with whom I have

had countless discussions of layered intru-

sions; Hn Gabrielse, what gave me much help in work that I have those in British Columbia;

To round out my list, I would also mention

tinu with three geologists with the Johns-

Manville Corporation—Stan Todd, Dong Keith, and Don Schissel—and I am most

ppurtunity.

vection as an igneous process. At Stillwater the feature of interest has been a platimum-

to go to Greenland in the first place, and

tures and I have enjoyed the splendid

student, was deeply involved. Charlie had

me to work on it full time.

lent groumlwork.

tories. On that survey we geologically

El Chichón Data

The March-April 1982 eruptions of El Chichon have produced the largest atmospheric impact of any eruption since at least Kraka-ian in 1889. The main geological variable that is responsible is the about mally high S were prime forces in promining and carrying content of the crimted magnia. The ultimate source of this sulfur is still unresolved.

Some highlights of the scientific papers dealing with the eruptions and presented at the AGU Fall Meeting in San Francisco, December 10-11, are discussed below. (The alistracts are in Eoc, November 9, 1982, pp 897-898, 900-902, and 1126-1127.1

Wendell Dulliehl et al. described the gen logic setting. Although scanty inbornation is available, El Chicloin was an inconspicious, dome-capped stratovolcano with active surtrusions. I have been back to Duke Island; face geothermal activity before the emption. I have worked on Axelgold in British Columbia; Skaergaard in Greenland; Stillwater in At least two prehistoric emptions on arred in the last 1250 years. The videand is built on volcanic and sedimentary rocks of Terriary age which overlie Cretaceurs sediments. A bith Complex in Minnesora. The opportunity drill hole near the volcame into the Cretaceurs section has penetrated evaporite beds. to compare all these horlies has been womber-Dulheld et al. suggested that these rocks may ful, all the more so because of Hat's embusihave influenced the magmatic volatile fran-In the past few years, Skaergaard and Stilltion of the 1982 magma.

Servando de la Uruz described ground ob servations of the emption. The 1982 activity consisted of three main eruptions: March 28 at 2332 (local time). April 3 at 1935, and April 4 at 0533. The first emption destroyed part of the summit donne, produced an emption rolumn 17 km high, lasted about 5 h. and caused a widespread ash fall over sombern Mexico, Belize, and northern Guatemala.

The second phase of the empion was dueumented in a speciacular sequence of nighttime photographs which show the growth of the incambes on oriquion column and volcanic lightning. A pyroclastic surge occurred in the first 10 minutes of this emption. Cruz's pictures show the cullapse of the emption column and the movement of a pyroclastic flow down one of the river valleys to San Francisco Leon. The flow front, brightly inandescent and apparently turbulent, was nb-

vious in the photographs.

The third eruption profluced an airfall deposit only, from a similar magnitude eruption. column. The three eruptions were similar in the volume of material crupted. Various speakers estimated the total volume erupted at 0.4-0.6km3 of dense rock.

As a result of the eruptions, there is now a

Antarctic Research Series Vol. 33 Dry Valley

Drilling Project LD. McQinnis, aditor Cora analysis is the major emphasis of

DVDP. The wealth of scientific data from these (first) rock drillings make a vital contribution to understanding the gaologic and glacial history of the McMurdo sound araa. The vast ice-frae valleys of Antarctica virtually unexplored, bacama the research center for a cooperative international venture between the U.S., New Zealand, and Japan. DVDP chronicles the final raports of the U.S. scientists. The very significant conclusions in this volume will be the basis for the next generation of studies and projsets to be carried out in Antarctica.

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craier occupying the site of the oblidume, pyvoclastic surge (or low aspect-ratio ignimative) deposits all around the croter, and pyroclastic llow deposits down river channels for several kilometers. These disrupted drainages and caused many secondary labors.

A network of seismographs was operating in a six-station telemetered array for 2 years prior to the 1982 reuption. The data, studied remospectively due to the remoteness of the mations, and reported by S. K. Singh et al., show a seismic build-up which began weeks before the emption, and increased sharply on March 1. The high seismichty lasted through March 28 Ian stopped completely 2 h before the first emption. The depths of one type of rarthquake, thought to be associated with the magina-groundwater contact, was about 5 kin. There were also a significant wunder of quakes at 15-20 km depth. This suggested to de la Cruz that there may be a dual magna-

 Varekamp and J. Lado in separate pa pers reported on the extent, periology, chemisny, and mineralogy of the ash. The ash is fine-grained (85% <1 non), highly dispersed. and has the characteristics of a phuran tranational to phreatophiniant fall deposit, with three fall units, assumed to correlate with the three emptions. The ash fell out of the armo sphere parily as aggregates, which Varekimp proposed were held together with sulturic acid. The magna was an alkali-rich trachyandesite with 56% SiO2, 2.8% KgO and an extremely high S content (0.5-1.0% S). This S concentration is more than 10 times that "expected" for a magma with the composition of El Chichon's. It is also about 50-100 times greater than the 1980 Mount St. Helens dacite. Andesite, horubleude, augite, magnetite. sphene, and aparite are phenocryst minerals, but compelling evidence was given by Luhr to

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Olhar Tillee

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1,191.

(cont. from p. 451)

show that 1% volume anhydrite oricrophenocrysts subserved in these racks was also in equilibrium with the magma

Unitial isotopic data on S and D in the anhydrite obtained by R. Rye suggest that the evaporites below the volcano were not the source of the anhydrite. Lahr estimates the ioagma temperature was about 800°C before eruption and that it contained 4-5% HaO and 2.5% S.

J. Holfer presented data showing chemical compasition of the fallout varied with distance frum the volcam in a manner consistent with atmospsehric fractionation

S. Sell emphasized the point that explosisity of an eruption is a poor index of amuspheric impact, using examples frum recent history. He suggested that modest-sized, exvlosive andesitic eruptions, similar to the El Chichon excut except in the extreme S content, might be the most important cause of stratusphieric optical depth perturbations. If andesitic ecuptiums can be shown to be typically S rich, this conclusion would be

The atmnspheric scientists presented basic data on the stratospheric effects of the eruption. There were many measurements docismenting a 25-33% decrease in solar radiation at the earth's surface due to the El Chichon stratuspheric particles. The Manna Loa Observatory group reports that this is the largest decrease in atmospheric transmission in the 24-year record there.

A. E. Strong (NOAA-NESS) showed that sea surface temperatures over a broad area of the equatorial Pacific were rising at an abusrmal rate since the eruptions. The effects on North American weather may be to alter the storm tracks and result in an innisual, but not necessarily colder, winter in North America. A. J. Krueger [NASA-GSFC] showed that SO2 from El Chichon in the strutosphere caused a spectral interference with the Nimhus 7 Total Ozone Mapping Spectrometer (TOMS). The interference wiped on the ozone experiment, but allowed the total mass of SO₂ released to the stratosphere to be estimated at 3.3 x 10°T. This is 10-15 times the mass estimated by rlifferent methicls for Moune St. Helens.

This meeting report was contributed by W. I. Ruse, Department of Geology, Michigan Technological University, Houghton, MI 19931.

Opinion

A Section (1)

Forecasts and **Predictions**

In recent volcanologic literature, the terms forecast and prediction have generally been considered synonymis. Hodge and Guest [1981], however, in assessing the possibility that Mount Etna would crupt before May 1982, stated that "these are not predictions of specific events but general forecasts . . . based on the behavior of the volcano during the past seven years." Lockwood et ol. [1976] used the term forecast in anticipating an eruption of Mauna Loa before the summer of 1978 on the basis of historical records. In contrast, Wood and Whitford Stark [1982] used the terms forecast and prediction synonymously when they anticipated an emption of Kraffa before the end of May 1982 by projecting records from 1975 to the end of 1981; in terms defined here, this statement was a forecast. The fact that all three of these forecasts proved incorrect indicates the relative uncertainty of simply projecting past records and it suggests the desirability of distinguishing, whenever possible, such general statements from more specific predictions based on repeated measurements of changing phenomena un a short time scale.

Three types of written public statements about vulcanic activity at Mount St. Helens are insued by sciennists at the Cascades Vnlcano Observatory of the U.S. Geological Survey and at the Genphysics Program of the University of Washington:

 A "factual statement" describes current combitions but dues nut anticipate future events; such statements are revised when warranted to keep the public and government informed of new developments.

 A "forecast" is a comparatively nunspecific statement about activity expected to occur weeks to decarles in advance, issued commonly without that from repeated monituring, and based on a projection of geologic, geophysical, ur geochemical records. Another kind of forecast uses monitoring data whose Intillentions are not well understood. Forecasts ald particularly in land use planning and in the development of emergency response plans.

 A "prediction" is a comparatively specific statement giving place, time, nature, andideally—size of an impending eruption. The likelihood of an eruption should also be stated, but such a statement is difficult to quanti-

Predictions are generally based on measurements of relatively short-term chages in ongstanding patterns of activity, Predictions may evolve from forecasts and should become increasingly more specific as the erup-tion nears. At Mount St. Helens, a prediction is issued a few hours to a few weeks before an eruption—any time there is a relatively clear view of future activity as judged from current similarities with past precuisory pat terns and from interpretations of the active volcanic processes. Predictions retluce risk tu life and property and provide a public test of

scientific hypotheses about volcanic processes. Stratigraphic studies led to a 1975 forecast of renewed activity at Mount St. Hclens "periaps before the end of this century" [Craudell et al., 1975]. On the basis of seismic, geodetic, and geologic rlata, forecasts for an cruptiun and landslides) in the near future were issued in March and April 1980 before the catastrophic emption on May 18, 1980. Forecasts in March and August 1981 anticipated dominantly nonexplosive behavior over the next months unless some reversal in geophysical or geochemical indicators occurred; these

forecasts remain in effect. Correct predictions were made of all 13 eruptions at Monni St. Helens from lune 1980 to the end of 1982 on the basis of integrated geophysical, geochemical, and geologic monitoring. Predictions several days to 3 weeks before cruptions were based largely on patterns and rates of ground deformation ul the crater floor and lava dome; predictions thin about 3 days of emptions depended chiefly on rates of cumulative seismic-energy release and increased numbers of shallow, volcanic earthquakes. I'redictions in February and March 1983 were not as successful, owg in large part to poor weather, which cur-

tailed most munitoring, and perhaps to subtle changes in behavior of the volcano. Subdividing the broad category of anticipatory statements into relatively nonspecific forecasts and relatively specific predictions may have general applicability in volcanology. Volcanologists commonly are called upon tu make statements about the future that are based either on projections of past geologic or geophysical records or on insufficient or poorly understood data. Such statements can profitably be distinguished from those based on adequate, up-to-date data on changing conditiuns at a volcano; such a distincti sclentifically honest and can help public authorities in their evaluation of the statement. There will always be gray areas; in such instances, forceasts rather than predictions should probably be made. In many cases, swever, the distinctions are relatively well defined, and the procedure used at Mount St. Helens can be considered.

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Donald A. Swanson David A. Johnston Cascades Volcario Observatory U.S. Geological Survey Vaucouver, IVA 98661

Krafla Revisited

"Predictions" of imminent volcanic eruptions are more successful than are "forecasts" of impending activity if we use the terminology defined by Swanson in the accompanying article. The implication is that, despite occasional intervals of periodically recurring eruptions, the long term (months to years) activity of volcanoes is stochastic. Once magma rises near the surface, however, and initiates measurable phenomena (harmonic tremor, inflation, increased furning, etc.), a volcano appears to be locked into a nonreversible process leading to an emption weeks to hours hence. Each type of forewarning is valuable. and USGS volcanulogists have demonstrated that the basic monitoring and prediction tech-niques developed for effusive eruptions in to explosive activity in the Cascades. But longer term forecasts, as pointed out by Swanson, are still largely un-

Nonetheless, we believe that forecasts should continue to be made and published for two reasons. First, the forecasts may be correct, providing a longer time for planning of monitoring activities, evacuation plans, etc. Responsible furecasts also serve to increase awareness of volcanic hazards among local authoritles, so that when eruptions do come, there has been in least psychological warning. Second, a forecast is based upon observed patterns of activity of u volcano and thus is also an attempt tu describe and understand eruption processes. Faulty forecasts have one advantage over erronenus predictions; The former do not have the immediate social and political consequences of the latter (see Bostock, 1978, and numerous replies).

Our forecast of an eruption at Kraffa caldera before the end of May 1982 was wrong. There has not been any eruptive activity since November 1981 and continued monitoring by Icelandic scientists reveals no evidence for an Impending eruption. We could attempt to neutralize our forecast fallure by any or oll of the following arguments:

(I) Kralla failed to maintain its previous 4:year pattern of artivity. 12) Inflation shifted to new areas immediately prior to our analysis, perhaps altering

magma supply processes and rates. (3) Volcanues do not empt forever; ir had

to stup some time. All of the above arc true; we did not make a mistake in our analysis or forecast—we simply had the bad luck to discover an emptive pattern one cruption too late. Because the emptive pattern has failed there are now no hints for forecasting possible future activity at Krafta, but monitoring will provide data for future predictions.

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ogists, J. Volore, tienthermal Res. 4, 1, 18 James L. Whitfords Circlingy Department, Sul Ross State Unite Alpine, TA 740

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Cooke-Ravian Volume of Managing the Ocean Volcanological Papers

Geological Survey of Papua New Guinea Memoir 10, R. W. Johnson (Ed.), Geological Survey al Papua New Guinea, Port Mureshy, 265 pp.

Reviewed by Chris Newhall

A splendid volume entided Volcanisor in ustralasia and edited by R. W. Johnson (Elsevier, New York, 1976) introduced many readcrs to volcanoes of Papua New Guinca. Nnw, Johnson and the Geological Survey of Papna New Guinea have published an equally splendid sequel that is a tribute to vulcanolugists Rob Cooke and Elias Ravian, killed during die 1979 eruption of Karkar Volcanu, From 8am and Blup Blup to Bagana and beyond, 25 papers in the new work cover a wide variety of topics-including reconnaissance mapoing and straugraphic studies, interpretations of legends and old historical records, detailed studies of Karkar lavas and Rabaul pyroclastic deposits, and documentation of the precursors and characteristics of some rerent eruptions. A wide variety of volcanoes is also covcred, from small stratovolcanoes and chunes to large caldcras.

Researchers of Papua New Guinean vulcanism have used an imprivative and programatic cumbination of historical recurds, geomorphologic and geulugic information, and in re-cent years petrological and genphysical data to learn a great deal about their subjects. This book captures the full scope of these studies and in sn rloing tells us not unity alarm specific volcanoes but also how to study them in spite of limited resources, difficult higistics, discontinuous exposures from island to island, dense tropical vegetation, and deep

In several respects the Cooke-Ravion Valume complements l'ofravism in Australasir and should be read with the latter in hand. Many papers in the later book assume familiarity with topics covered in the earlier rune, e.g., tectonic and petrologic studies in Papua New Guinea. Together, these two viduues are a major step toward an updated version of the Catalogue of Active Volvanoes for Alelaucsin (IAVCEI, Naples, 1987) and a comparison with the Catalogue shows that nearly has been learned over the intervening years.

A strong descriptive thread runs through the volume. This thread is both its liurlamental strength and an appropriate relicetion of the groundwork that needs to be drine before one can get un to more interpretive studies. Descriptions of emptlum precursurs and characteristics are excellent. I must arimit to wishing that some descriptions of older py-roclastic sequences or morphologic furms harl been carried through to more interpretive overviews, but these gaps between description and interpretation can be a challenge trr luture workers. Several papers do go beyond description and are important contributions to an understanding of volcanic processes. A paper by McKee et al. on hydroeruptions at Karkar is an especially thorough and interesting examination of the mechanism of hydroor phreauc eruptions, the very hazard that

claimed the lives of Rob Cooke and Elias Ra-The volume is printed on high-quality paper stock and is clothbound. Its photographs are at once a strength and a weakness; their number and selection are excellent, but the quality of their reproduction is mixed, with mony photographs blurred by poor printing. Perhaps in a second printing this fault could be corrected. Overall, the book is an excellent

value at approximately \$30 (22 Kina). The volume contains a glossary and abstracts in Tok Pisin (Papua New Guinea Pldgin) In an attempt to attract a wider Melaneian audience. At the very least this is symbol ically important, and I hope that this wider audience is reached. Volcanologie studies are of interest not only to the international nick the growing Papua New Guinean scientific communities, but are also of vital importance to the many people who live on or near Pn-pua New Guinea's octive volcanoes.

Chris Newhall is with the David A. Johnston Cascades Volcano Observatory, U.S. Geological Survey, Vancouver, WA 98661

Resources of the United States: The Role of the Federal Marine Sanctuaries Program

D. P. Finn, Lerture Notes in Cossist and Escribe Stud., vol. 2, Springer-Verlag, New York ix + 192 pp., 1082, \$16.

Reviewed by Giulio Pontecorvo

In 1969, the Straton Commission report provided a plan for the systematic decky ment of a national policy on marine allies In subsequent years no such systematicaproach to a cuberent marine policy rates dertaken. The de facto policy approached the 1970s was a plethora of individuality tive acts which pravided specific de jur-rules, but which left administrator theor plex problems of working out the adminis tion of areas of overlapping authority, sit conflicting nr inconsistent goals and junde tiun. The major acts of the 1970s, the Fale Camservation and Management Acol Sa Mammals and Non-Migratory Birds-The Marine Mannual Protection Art of 1972. Coastal Zone Management Act of 1972 E rlangered Species Act of 1973; Marine Pro tection, Research, and Sanctuaries Actol 1972; and others, are clear indications da national commitment to regulation of the markets for the output from the ocean seat Hut while the need for intervention in markets was clear to legislators, the failure total play a systematic approach and provide suidelines adequate in permit the rational turn ref compries prublems doomed the pi meal approach to orean policy to ever it rreasing arbuintstrative problem and with

mately to ineffective government programs
In his manograph, Managing the Octan's
sources in the United States, Daniel P. Finding carefully dricumented certain of these kgd and administrative issues that have signiand arrund une of these pieces of legistical of the 1970s, the Marine Sanctuaries Progratu. The municiparaph starts by developed three case studies: (1) the od and garless on Grurges Bank which focuses co conficing statulency issues, (2) the Santa Bailers Channel problem of overlapping regulary authority, and (3) the resources of the case continualal shell where there are gaps in the

statutory multurity. In turn, these case studies provide the for examination of a set of specific question.
"Cam furleral agencies, administering discreregulatury and prutective programs formation consistent decision and consistent decision and consistent decision. on marine resource development? Shook specific provisions be made for special made agement of marine areas with especially able resources or a high probability of select user ur resource conflict? Are all valuable marine resources subject to legislative auti ity and can they be adequately protected through existing programs? How chieffer the federal medical in a chieffer. the federal management system in action balanced decisions?" (p. 3)-

of the legal processes surrounding program implementation. With the case studies a co-The case studies provide dence, the monograph then goes on to ine, in three more chapters, the specific sues, coordination between agencies the

problem of definition of programs, many ment difficulties, the institutional persent of the managers, political pressures, etc.

This monograph is a valuable handlow an important reference work, and also as the property of the monograph is a problem. sense, it is an object lesson in how not lost

There is one serious omission in the serious on legal and policies sues is to leave out the underlying relief for action. The concept of a sanctuary and requires an adequate structure of blooms and economic analysis to justify it relatest and economic analysis to justify its can give to defend it against alternative uses and give it a set of objectives that can guide and against alternative uses and against alternative uses and against a set of objectives that can guide and against a set of objectives that can guide and against a set of objectives that can guide and against a set of objectives that can guide and against a set of objectives that can guide and against a set of objectives that can guide and against a set of objectives that can guide and objectives the condition of the condition objectives that can guide and objectives the condition objecti

agement actions.
Finn has provided an important serves describing how the system worked. We need better understanding of its tailouide.

Guilio Pontecorvo is with the Gradual Stand Business, Columbia University, New York, NY 10027 10027. . .

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Deputy Assistant Administrator for Oceanic and Atmospheric Research. The Office of Oceanic and Atmospheric Research (OAR), National Oceanic and Atmospheric Administration (MC) Amospheric Research. The Office of Oreanic and Amospheric Research (OAR), National Oceanic and Amospheric Administration (NOAA), has announced the vacancy of Deputy Assianan Administrator for Oceanic and Atmospheric Research, located in Rockville, Maryland. The Office of Oceanic and Atmospheric Research is responsible for an Integrated NOAA oceanic and atmospheric research and development program. The program consists of laboratory and extramtiral research projects that are relevant to NOAA service and resource management programs, and that provide sound technologicals and scientific principles on which to base interested in the programs of those services and products. The lepaty Assistant Administrator functions as full lepaty and alter ego to the Assistant Administrator. In the absence of the Assistant Administrator. Is responsible for determining future directions for office programs, setting priorities of current and future programs, and allocating resources. Undertakes special assignments to revelop and recommend new or modified policies and profit and politically sensitive toture. Works with the Administrator, Deputy Administrator and Assoriate Administrator and chining objectives; with external roustinuencies in developing the substance of OAR programs; and with Congressional and outside interest groungs in taking these programs to the requirements of the political scene. Also works with other Federal agencies to sthieve eoordinated research un problems of common interest. Provides anthoritative representations. des to achieve coordinated research on problems of common interest. Provides authoritative representa-tion to intergovernmental, national and internation-

some intergovernmental, national and intermination to intergovernmental, national and interminationals and meetings concerning NOAA interests in the areas of oreanic and attempoleric science and technology. Participates in hilateral ucquitation and in Interagency coordination merhanisms.

QUALIFICATIONS: This is an exciting and challenging opportunity for an individual with demonstated knowledge of oceanographic, metworological environmental, physical and/or engineering science invitonmental, physical and/or engineering science invitoding at least 24 securester hours in physical science at the rollege level). Broad knowledge of carnet problems, issues and programs in the lichlest of oceanic and atmospheric science is required.

SALARY: This position will be lifted under the Seufor Executive Service (SES). Salary could range from 16,945 to 367,200 per annum. APPLICATION: Interested persons should call the NOAA Head-quarters Personnel Section, 301-443-8373, to receive application of the romplete varanty aumountenent and

quarters Personnel Section, 301–443–8373, to receive a topy of the romplete variancy aumountenent and qualification requirements. Applications must addrete the specific qualifications required in that announcement. Applicants must also acent a U.S. Standard Form 171, Personal Qualifications Statement, to Mrs. Susan D. Cisar, Personnel Management Specialis, Headquarters Personnel Section, ATPIER1, NOAA, 6001 Executive Bunlevard, Rorkville, Muryland 20852 by August 20, 1983.

The Department of Commerce, National Oreante and Atmospheric Administration, is an Equal Opportunity Employer.

Professor of Mcieorolgy/University of Maryland.

The Department of Mctoorology at the University of Maryland, College Park, invites applications for a knure line Professorship. We seek a well-established, highly recommended scientist with an out-wanding international reputation in atmospheric and oceanic modeling and applications. We propose the establishment of a center to study the interaction of atmosphere, ocean and land processes and their impact on climate variability, and in particular to study the feasibility of short term climate predictions. The applicant should be qualified to head such a Center, plan its projects, organize its activities, and bring to the University the necessary resources to attract outstanding scientists to the Center and to carry out its research functions. Salary is as the sames of references to the Chairman. Search Committee, Department of Meteorology, University of Maryland, College Park, MD 20742. Applications received by 22 joly 1983 will receive fault University of Maryland, subscribes to policy of equal educations.

inc University of Maryland subscribes to policy of equal educational and employment opportunity. The University of Maryland is sequred by Title LX of the Education Amendment of 1972 not to distinguise on the basis of sex in admission, treatment of Mudents or employment.

Physical Decemography/University of Rhoda Is-land. A postdoctoral research associate position is trapical processes in the Pacific. The research in-solves the collection and analysis of deta relating to the dynamic topography and ground pressure gradithe dynamic lopography and zonal pressure gradi-the dynamic lopography and zonal pressure gradi-this of the equatorial corrent systems as part of a log-term study of ocean influences on climate. Submit resume and professional references by Au-Rut 13, 1983 to: Dr. D. Randolph Wans, Marine Ricarch Associate 11 Position, UNIVERSITY OF RIODE ISLAND, P.O. Box S57, Kingston, Rhode Island 02881.

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Research Assistant to Ico Core Analysis/Ohio State University. Applications are invited for a position at the Inalitate of Polar Studies. The Ohio State University, beginning October 1, 1983. Primary dutenance of the Coulter counters in the class 100 clean room, and processing ice and firm samples. Microce or engineering and suitable laboratory experience for equivalent experience. Please send applications, deadline 1 September 1983, to Director, Institute of Polar Studies, Ohio State University, Co-The Ohio State University is an equal opportunity of the processing of the processing of the process of the process

Postdoctoral Poaltion in Hydrologic Modeling/
University of Arisona. A postdoctoral appointment in the area of modeling and calibration of hydrologic rainfall-runtoff models will be available beginning September. 1983 in the Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ. The initial appointment will be fur one year. The salary will be \$20,000–29,000 per year, depending on experienre. The primary source of funds is a grant by NSF for the improvement of the reliability of compartmental models.

QUALIFICATIONS: The successful applicant must have received the Phd. degree in Hydrology and/for Systems Engineering or a closely related field by the starting date. Preference will be given to applicants with expertise in the field of mathematical modeling identification and parameter estimation theory.

tion theory.

TO APPLY: Send a complete resume and the manus of three references to: Professor Soroosh Sorooshian, Assoriate Professor, Department of Hydrology and Water Resources, University of Arirona, Tucson, AZ 85721. Telephone: (602) 621-8181.

The University of Arirona is an equal opportunity filtransity eaction complete.

Research Scientist for International Ground Water Modeling Centes. A position is inmediately available for a Research Scientist in the International Ground Water Modeling Center, IGWMC is an international information center for ground water modeling. It organizes an annual series of short rourses, provides assistance in workshops and seminars, operates a clearinghouse for ground water models, conducts a program in applied research on ground water modeling, and publishes the Ground Water Modeling Newsleuer.

The successful applicant will have a Ph.D. in Civil Engineering/Hydrology with a background in quantitative ground water hydrology, including chemistry of ground water. The person must lave at least one [1] year experience in modeling flow and transport processes and should be acquainted with relaced rerent research. A solid background in numerical and stochastic analysis is required.

ed rerent research. A solid background in numerical and stochastic analysis is required.

Incumbent will perform the applied research program of the Center, including exploring modeling needs and research trends, and technical evaluation of models, and will be involved in the continuous updating of the Center's model information system MARS, in conducting the training programs, and in landling information requests.

The annualized salary for the position is \$28,000 for a \$7.5 work week, typically from 8:30 a.m. to 5:00 p.m.

5:00 p.m. Interessed applicants must include ID number 042860 and social security number in a response le

042860 and social section, July 28, 1983 to: Inrlian State Employment Service 10 North Schale Avenue Indianapolis, Indiana 46214 ATTN: W.F. Shepherd An Equal Opportunity Employer

Postdoctoral Postston/Naval Postgraduate School.

The Occan Turbuleure Laboratory has available a postdoctoral position for a person interested in the analysis and interpretation of oreain turbuleure data. The tenure is for one to two years. The successful candidate should have a Ph.D. in physical occanography and although experience with intotalence data is preferable it is not essential. The opportunity for involvement in data gathering expeditions is also available.

Resumes can be sent to the R.G. think Code.

Resumes ran be sent to fir. R.G. Lucck, Code folloy, Naval Postgraduate School, Montetey, CA

An Equal Deportunity/Alternative Action Em-

Postdoctoral Posicion in Aimospherie Chemistsy and/or Cloud Physics/Georgia Inscitute of Tachnology. Recent Ph.D. scientists interested in the development of theoretical models to study the chemistry and physics of precipitation are invited to apply to the Georgia Institute of Technology.

The salary is \$18,000/year; period of appointment is one-two years. Applicants should send vita and statement of research interests and the names of two references to: Professor W.L. Chanteides, School of Geophysical Sciences, Georgia Institute of Technology, Atlanta, CA 3052.

GEORGIA INSTITUTE OF TECHNOLOGY IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.

Geophyalelsi/University of Sagkatehewao. Subject to linal budgetary approval, the Department of Geological Scientea will have a new tenurable position in geophyaics available July 1, 1984. Applicants should hold, or be about to receive, the Ph.D. or equivalent degree. They will be expected to teach undergraduate and graduate courses in geophysics and to build and maintain a vigorous research program. Excellent research opportunities exist in crustal and exploration seismology and in all fields of mining geophysics. The department, to occupy a new building in 1983, aiready has well-equipped geophysical and data-processing facilities. Applicants alrould send a letter outiliting their teaching and research goals, accompanied by a full curriculum vitae including the names of at lesst three referees, to Dr. W. G. E. Caldwell, Head, Department of Geological Sciences, University of Saskatchewan, Saskatoon, Canada S7N 6W0.

Research Scientiat/Space Plasma Physics, University of lows. A research position is available in the Department of Physics and Astronomy, The University of lows, for theoretical and interpretative studies of waves in space plasmas. Specific emphasis is on theoretical investigations of wave-particle interactions in planetary magnetospheres and in the solar field. ies of waves in space passing of wave-particle interactions in planetary magnetospheres and in the solar wind. These investigations are to authors the interpretation of data being obtained from spacecraft projects such as Dynamics Explorer. International Sun Earth Explorer and Voyager. The applicant must have a Ph.D. with good qualifications in plasma physics theory and shoud have some experience in the interpretation of space plasma physics data. Send a resume and the names of three references familiar with the applicant's work to D.A. Gurnett, Department of Physics and Astronomy, The University of lows, lowa City, lows 52242, telephone 319-355-3527.

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Selsmologist. The Institute for Petroleum Research and Geophysics in Holon, Israel, is teeking a seismologist to work on problems of earthquake risk assessment. Employment is for a period of ono year with possible extension. Experience in statistical evaluation of earthquake risk is preferable but not mandatory. The Institute is a government owned company located in a solurb of Tel Aviv. It. Is responsible for most of the geophysical work in Israel and it has an active seismological program including countrywide and local relemetered seismic networks.

Benefits include relocation expenses, housing allowance and a car. For details contact Dr. A. Shapirs, Head, Seismological division, The lossitute for Petroleum Research and Ceophysics, P.O. Box 1717, Holon 58117, Israel, Telephone 03–805112.

大学的 人名英格兰 医乳管管 化二氯化

University of Colosado, Bouldes, Geochemist Position. Teochemist with a rive research program, stable isotopes, tadinarrive isotopes, and/or trare elements is being sought for a joint appointment in the Department of Geological Sciences and the Congerative Institute for Research in Europromental Sciences (CIRES) of the University of Colorado.

The one-lialf time position within the Department of Geological Sciences is tenure track at the assistant or associate professor level with a starting salary of \$12,000—\$15,000 for the arademic year.

Teaching load will be half that of Iuli-time laculity. The position within CIRES will be as a Fellow with appropriate office and laboratory space. One-half academic year salary will be guaranteed by CIRES fur two years at the departmental rate, after which incumbers must generate his/her CIRES salary from esternal sources, turumbent may augment salary further by generating three months of sun-

ry further by generating three months of sun-r salary from contracts and grams, and rousult-

ing.
Applicants with experience, publications, and/or muvable existing research equipment preferred.
Preferred starting date would be january 1, 1984.
Closing date for applications is Ortuber 1, 1983.
Applications should include statement of research and leaching interests, experience, a full vitae, and four letters of reference.
Apply to: Professor Uharles Sterm, Chairman, Goodennist Search Committee, Department of Genlogical Sciences, Campus Box 250, University of Colorado, Boulder, CO 80309.
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The University of Columbu is an equal oppositu-ity/affirmative action, Section 504 employer.

Universalté du Québec, Rimouski/Faculty Position lo Geological Oceanography. The Université du Québec à Rimouski secka qualified pessous to full the following position: Full-time professor of geo-logic de geography.

igiral occannigraphy. FUNCTIONS: The sucressful candidate will be repared to teach contress at the undergraduate and graduate levels and in develop teer contress it sub-jects such as inheratogy, stratigraphy and intercopa-teoniology, and will be expected to collaborate with existing research programs in the field. existing research programs in the fields of boutto boundary layer, biogeochemistry and coastal sedi-

REQUIREMENTS: The successful candidate

REQUIREMENTS: The successful candidate must pussess the dictorate in geological oceanugraphy or marine geology with specialization in unnerslugg and/or micropaleotrology, and direction research involving Quaternary marine deposits. Courses are given in French.

All applications will be recated confidentially, it in addian law requires that Causalian titizens or handed immigrants be given preferences, futerested persons should send their corricultum vitae hybore August 15, 1983 to: gust 15, 1983 to:

Directeur Département d'océanographie Université du Québec a Rumonski 300, avenue des Ursulines Rimonski, QC G51, 3A1.

Research Scientist tt. The Solar-Terresitial Theory troup at the University of New Hampshire seeks applications for a research scientist II to un-derake a variety of theoretical problems on plasm and MHD processes in the solar atmosphere and the solar wind, and related energetic particle phe-

nomena.
Minimum qualifications: Applirant nums possess a Ph It is consistent protessional degree, with re-cearch leading to do not are, with training in the act-ical space plasma physics or a related field, (e.g., theoretical plasma fusion research), or masters detheoretical plasma tusion research, or masters de-gree and at least three years of research experience which is riosely related to project work. Salary range \$20,110 to \$31,260; normally starting salary not to exceed \$22,510. Resume and three letters of refer-ence should be sem before August 15, 1983, to: Dr. J. V. Hollweg, Department of Physics. University of New Hampshire, Durham, NH 03824. The University is an affirmative artion/equal op-portunity cambio er.

Iowe Stere University of Science and Technology, Department of Earth Sciences/Research Associates Electron Microprobe. The Department of Earth Sciences Invites applications for a Research Associate position as an electron microprobe specialist. The appointment will be a fully funded, permanent, twelve-month position. Salary will be rommenurate with our life at 1918.

with qualifications.

Primary duties are the operation and maintenance of a fully outomated microprobe with WDS and EDS capabilides and the supervision of a sociated laborstory facilities. Additional duties include the instruction of research personnel in instrument operation. Ample opportunities exist for conducting collaborative and independent research involving the microanalysis of geological materials.

Applicants should have a M.S. degree in a science or engineering field, or equivalent experience, and experience with electron beam instrumentation. Persons with a working knowledge of WDS and EDS spectrometers and the accompanying computer operations and experience analyzing geological samples will be preferred applicants.

Application deadline is July 51, 1983. Later applications will be accepted if the position is nut filled. Applications should include a complete resume, a atatement of background and interests, copies of publications and names of at least three references. Applications should be sent to:

Bert E. Nordlie

Department of Earth Sciences

lown State University 253 Srience 1 Ames, Iowa 50011

fowe State University is an equal opportunity/af-firmative action employer. University of Arizons/Faculty Position. The De-University of Arizona/Faculty Position. The Department of Hydrology and Water Resources invites applications for a faculty position in hydrology with a specialty in grotteri-water chemistry. Candidates must have training and/or professional experience in hydrogeology and must have demonstrated abilities in the quantitative aspects of the topic. A positionent will be at the level of an assistant or associate professor. Interested individuals should obtain further information from:

Professor Stanley N. Davis Chalrman, Search Committee
Department of Hydrology and Water Resources
University of Arizona 85721
602-621-3151.

The University of Arizona is an affirmative ac-

The University of Arizona is an affirmative ac-

CNOC Chair in Mapping, Charting and Geodesy (Hydrography)/Department of Oceanography, Naval Posigradosto School, Monterey, California.
Under the aponsorably of the Commandor, Naval Oceanography Command ICNOC), a Chair in Mapping, Charling, and Geodesy (MC&G), with emphasis on Hydrography, has been citablished in the Department of Oceanography, Naval Postgraduate School (NPS). The objective of the Chair is to promote MC&G studies and research by students and facility, and to encourage acquaintance of the Chair

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The incumbent's principal responsibilities will be to cunduit research and to supervise student rhesis research of a type that will interface the Hydrographic Sciences Program of NPS with the MC&1: needs of the Navy. A favored theme is research applicable to operational hydrographic survey problems.

Academic excellence and the ability to bring fostlinew ideas are the primary ronsiderations in the selection process. The term of appuintment will normally be for swelve month periods (1 Ocrober to 25 September); however, exceptions will be considered. Candidates may be members of the academix, federal, or private sectors. Where appropriate, Unteragency Personnel Agreements are preferable. For further information, comatt Professor C.N.K. Mouess, Chairman, Depastment of Oceanography, Naval Postgraduate School, Monterey, California 93940, telephone number 14081 646-2673. Send curriculum vitae/resume information and letters of interest to interest to the above address.

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Chairman—Department of Geological Sciences, Wsight State University. The Department of Geological Sciences, invites applications for the position of chairman, to be appointed September 1984. We seek a dynamic individual with administrative talent and an appreciation for research and practice-related educational activities. Rank is at the full professor level and no restrictions have been placed on areas of specialization. The department is active with 12 faculty and an emphasis on professional practice, yet maintaining a firm commitment to basic retearch.

icarch.
Send a lener of application, curniculum vitae and uames of three references to:
Chairman, Search Committee
Pepartment of Geological Sciences
Wright State University
Dayton, OH 45435.
Weight State University action

equal opportunity employer. Closing date for the position is October 31, 1985.

The University of Auckland, New Zealand. Post-doctoral fellowship ovaliable in the field of The Petsology and Tectonic Setting of Late Cenozoic Volcanic Activity in Northland, N.Z. Applicants about have a Ph.D. NZ\$1,805 per month plus return airfare. Enquiries in Dr. I.E.M. Smills, Givelogy Department, University of Auckland, P.B., Auckland, New Zealand.

Selamologist, Geophyalcia/Carnogio Institution of Washington. A nost ductoral position has just become available at the Department of Terrestrial Magnetism for a submologist/geophysicist with broad interests. Please mail ressure and request three letters of reference to be sent to Geophysica Fellowship Committee, Deportment of Terrestrial Magnetism, Carnegle Institution of Washington, 5241 Broad Branch Road NW, Washington, D.C. 20015.

Graduate Assistantehlps/Howard University.

Howard University in Washington, D.C., offers a new graduate program for the M.S. degree in geoscience; made possible by a grant from the Cult Oll Company. Areas of specialization are field genlogy/geophysics, geochemistry, and meteorology/hydrology, with remote sensing. Some aupends and assistatiships are available. Potential students should write to Dr. Eric Christofferson, Department of Geology and Geography, Howard University, Washington, D.C. 20059.

<u>Meetinas</u>

Announcements Southwest Water

An interdiniplinary conference on meeting the current and anticipated water needs for farms, municipalities, and industries of the Southwest will be held in Dallas, Tex., un April 3-5, 1984. Focusing on the technical, erroromic, financial, and legal aspects of this problem, the conference will explore eight inajor topics: water needs and demands, water availability, conspetition for water resources, strategies for increasing the availability of water, demand reduction, water conservation, water reuse, and protection of ground and surface waters.

Entitled "Water for the 21st Century: Will It Be There?" the conference will be held at Southern Methodist University in reoperation with several professional organizations and varinus regional, state, and federal agencies. Conference proceedings will be published.

Authors interested in presenting papers must submit one-page abstracts by August 30, 1988, to one of the separate coordinators apminted for the eight major topics of the conference. For more information contact the general chairman, Michael A. Collins, School of Engineering and Applied Science, South-ern Methodist University, Dallas, TX 75275 (telephome: 214-692-30fio).

Meeting Report Aeromagnetic Data Workshop

A workshop on aeromagnetic data, spon-sored by the National Geophysical Data Center (NGDC) of the National Oceanic and Atmospheric Administration, was held in Boulder, Cada., November 16-18, 1982, to evaluate the requirements for a national acromagnetic database. The following reconnucudations were developed by J. R. Heirtzler, Woods Hole Oceanographic Institution; W. J. Hinre, Purdue University: A. M. Hittelman, ARCO Exploration Company; K. Svemlsen, CIRES, University of Colorado; D. M. Clark, National Geophysical Data Center; T. M. Auderson, Union Oil of Calibornia; and P. Ochsuer and R. Van Nieuwenhuise, Uities

 A mational aeromagnetic anomaly data file of available digital data and a central distribution center are urgently needed in the United States.

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Magnetic methods have a long and successful history of mapping earth's rass for hoth scientific and applied objectives. Prohably no other geophysical data set provides as much information on as broad a range of geological problems, althrugh it seldom provides a unique answer to any one problem. The mag-netic method is primarily directed toward mapping the crystalline basement and igneous intrusive and extrusive rocks. These rocks are largely unknown because they are hidden from direct geologic observations by a cover of younger sedimentary rock formations and because only limited deep drilling

has been condurted in these areas. Thus, the magnetic method is used to map the structure and petrologic variations within

the crystalline rocks and in so floing attacks a wide variety of problems dealing with the geologic and tectanic history of the crust. Magnetic data have traditionally played a major role in petroleum exploration. In recent years, magnetic data have been applied to a host of new problems such as geothermal exploration, seismic regionalization, site stabilty, waste disposal, and plate tectonic studies. Furthermore, the ability to accurately observe magnetic data from airburne platforms has permitted the acquisition of rlata over rlifficult-access terrain and the correlation of continental and marine geological patterns.

It is clear that the uses of magnetic attonialy data are broad and are expanding beyond the purpose for which they were acquired. In fact, we have now reached a point where data takers are no longer the principal users; often the nonspecialist, who has no direct access to the data except through repositories, is a principal user. These data users in particular are interested in multiple data files for correlation purposes. Multiple data files are most effectively handled by a central repository. In the past decade, vast areas of the United States have been aeromagnetically surveyed at several different specifications by public agencles. Also, an increasing amount of anomaly data is available in digital fromat. It is impurtant that these data be put in a repository before they are decimated, filtered, or altered in a fashium that loses infurmation that may be useful to another user.

2. A standard clata-exchange format is

The establishment of a common digital format is important because nonstandard formats hamper data archiving and exchange. A standard format will accelerate the transfer of than, set a standard for the documentation. facilitate comparisons with other geophysical data, establish data precision requirements of the scientific rommunity, and reduce the data deterioration caused by reformatting errors.

For several reasons, the use of a format structure similar to that of the marine geophysical data-exchange format (knewn as MGD77) is desirable. The MGD77 format contains correlative data (marine magnetics, gravity, and bathymetry data collected at sen) and forms the foundation for the Geophysiral Data System (GEODAS), developed by the National Geophysical Data Center, GEODAS performs a wide variety of file management functions (e.g., field validation checks) and apports an oaline inventory system producing such products as trackline plots and tahu-

Though most of the data may result from national programs, collection may not be limited to U.S. data. Ultimately, some non-U.S. data will be included, and this could become a World Data Center function. Because format and instructions for submission of data to the World Data Centers are formally given in the "ICSU Guide to International Data Exchange," we recommend that the ICSU panel on World Data Centers include the class of airborne data in its next edition of the guitle. NGDC can help draft an appropriate section

We also recommend that the Society of Exploration Geophysicists (SEG) endorse the format. Consequently, SEG is being approached to sponsor this initiative and establish a working group to develop such a for-

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of the International Union of Geodesy

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August 15-27, 1983

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Supporting Members

The lullewing individuals have been added to the list of Suppeating Members. The full list was last published in the May 10, 1983, Eu.

Life Supporting Members

Arhelstan Spillraus Individual Supporting Members

Lloyd E. Brotzman William D. Crozier Sigmund I Hammer John C. Maxwell

plans to publish the proceedings of this will short that will include in-depth contribute of all speakers and many of the other and

This meeting report was contributed by Davi M. Clark, National Geophysical Data Center Allen M. Hittelman, ARCO Exploration Con-

Separates

3. A national magnetic anomaly survey

inventory is a necessary element in establish-

ing a natinual magnetic anomaly data hase.

netic anomaly tlata and maps have been ac-

quired by the U.S. Geological Survey, U.S.

Navy, U.S. Department of Energy, academic

institutions, and various state agencies over a

35-year period. The specilications of data ac-

quisition and reduction, as well as the size of

hensive catalug to inventory of these surveys

and their specifications has been compiled.

he survey area, are variable, and no compre-

4. An external advisory committee could

e of great value to NGDC and should be es-

NGDC, which has an excellent record of

against data centers a decade ago. They have

effectively used ad her groups and workshops to further their work. However, because of

the large amounts of aeromagnetic data that

should become available, a standing advisory

data management efforts meet national re-

tive than NGDC in acquiring tlata from in-

dustry, academia, and other government

The National Geophysical Data Center

quirements and to aid in soliciting new data.

An external committee should be more effec-

committee is recommended to ensure that the

serving the user community, has weathered

all the adverse criticisms that were leveled

Currently, most of the publicly available mag-

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Comparison of individual close sentiose shose large
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is sufficiently similar such that the affect on the
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below abour 20 ey. The anjor difference is found is
the actitation and melasion rates of some features is
J. Goodher, Enn., him. Name 18008. Geophys, Res., blue, Yeps: 3A0906

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Sewelms Lemographic determinations from 151 April 07

Massachusetts, 01856)
Sayrims temperature determinations from 151 days of incoherance eachtet reder anseurements at Milistone HTtl 141.50 S) from 1910 to 1975 were seelyad to characterias the mean deliy temperature to the lower thanmosphare (108-125 km). As smallylical model fitted to the measured temperatures contained terms to apacify the dependentias of the mean deliy temperature on day of yest lammal and essentement temperature on day of yest lammal and essentement temperature. The andel temperature and gromagnetir activity. The andel temperature and gromagnetir activity. The andel temperature and of comparable magnitude and took about the sentence of 3-102 to the mean temperature. The solar cotation of 5-102 to the mean temperature. The solar cotation of feota were found to be small. The produce a summar or later aumant temperature acceptance of the sentence of the smaller temperature acceptance of the smaller temperature acceptance. produce a Summar or Tatar auman temperature mariature. Georgaelt activity affects were determined on the heart of a delayed Eq index and a propagation delay of J.1 hours was obtained from the model fit to the Towar thermospharir temperature measurements. An increase in aither mean enter flux or approduced an increase in sam delly temperature, the magnitude of the increase in sam delly temperature, the magnitude of the increase generally heing larges at the highest attrudre. Comperiase of the model temperatured measured at Saint Sentin (440) showed aimilar essences ourietions but a larger solar cycle dependence at Milatons Will in attributed to the telluture high geomagnate lattude of this statton. J. Geophys. Ess., Sine, Paper 360865 J. Geophys. Ris., Slue, Paper 340848

0460 (Traveling lossaphacic disturbances)
LOCAYING TIO SOURCES WITH A MORTH-SOUTH CHAIN OF
RAFID-MEN 10005CH88S IN WESTERN GURRE
M.G. MORESO (Radiophysics Laboracory, Theyer School of
Englacer768, Dertmouth College, Randver, Haw Escapehire
01155

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Three rapid-rum lonescondes placed entually 150 be apart for detactination of the vector verion of TiO's, near Lal. I as methers have hampenire and Verment, were assumed with three are i lonespedig Laid out northward case Lad., 0, 4.5, and 6.0 in westers Québat along the predominant direction (north-northwest) from which devices TiO a striam et the few Hempshire-Verment saturch. Observations were seef for the three month period 7082 herch, April, May In a prightholary established are asset to the few Hempshire-Verment vertical. Height at asset period reduced by our failt-watched to the seed of the three month period 7082 herch, April, May In a prightholary example the light at asset of containons displays of without height at asset of the containons displays of the Y-layer critical. These fast fast the possesses asset as the first seed to a strict of the second asset form in the propagation time delays from him speak and direction of 118 treasic case be deduced. As asset of the correlation over many daytime hours of the potential correlation over many daytime hours, of the preference of the preference

the fib's go. On the other hand, source but to found to be located as Itteld as 200 in option to the network. 710 s and their conserve gravity as the network. 710°s and their consister grafty am prompate northward from these sources well at southward. The sources are evidently nature is north-mouth event for the, frequently edit bouths stations, upneed some 275 km appri, which can absorption of languaged signals at either edited station. However, when they are located at a lones and a station, they cause complete less of any further by confirming that they are stores of country are talled practition. They are believed to the to procipitation that they are believed to the forestly wayout.

Pad. Set., Paper 350805

January waven.

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O460 Yidea, waven and winds

IMME THEREDSPIRALE STRUCTURE FROM BILLSING INC.

IMMEDITIES STATTER PARAGE RESUREMENTS. IL. ISCUE.

ESPERATURE CONGRIENTY

N. U. Sand (Ravelie's Observatory, Vestler's,

Measunchunchi., O1859.

Ouyrime temperature determinations from 19 degrainceincoherent scatter radar measurements at milities in

LAND from 1410 to 1915 were analyzed to character
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the monaured temperatures contellection in the feat
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innoaphorise disturbances, lead to widely satisfapornes, a log-log presentation of wavelength; in
leads to a well ordered linear plot. Perfect in
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this redundancy hotwees the axes briegs about no
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the points. The slope of the inner teg-leg live the points. The slope of Los interesting apportunity by Minne [1960] when the slight be theoretisatly by Minne [1960] when the slight by viacous damping are Included. Scorper, for the particle, the choretical curva lies at significant higher values of wavelength and valuelty, (form) wavel.

J. Daophya. Ras., Stue, Paper 140894

Exploration Geophysics

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Juther Canyon (dress Valley), nest Vincenusca; Soda Cais, per fallon and XcCoy, west of Austin. The Ress is a frequenty-donain system using the RE-58 is a frequenty-donain system using the RE-58 is a frequenty-donain system using the rest of the surveys directory and applied +65 A to a 100-m dismeter typitch dars, we applied +65 A to a 100-m dismeter typitch dars, we applied +65 A to a 100-m dismeter typitch are the frequency range 10° to 18° Kz. With 166 a serve the frequency range 10° to 18° Kz. With 166 a serve the frequency range 10° to 18° Kz. With 166 a serve the frequency range 10° to 18° Kz. With 166 a serve the frequency and the person of the serve the frequency of the serve the serve the frequency of the serve the serve the frequency of the serve the serve

indicious. With the IR-00 date, we water among the depth to and inclination of a build conductive shely associated wife an area of high substuriate teaperstress, in this case, she EX resuits confirmed and suntilens are vices in forcastion. At the reason and such almost security is the presentation and gave additional stalls user-oursed information at the reason and such almost security is the affacts of this despote of the regard tortals. By modifying and the effects of this despote of the regard tortals. By modifying and the effects of this despote our about the same depth in the south and should differences on acoustings and thus totarpret facts. The Ramonings descreted a conductive some and should differences on acoustings and the totarpret facts. The Ramonings descreted a conductive some and should differences on acoustings and the hotory strength of the same depth. In addition, UK acoustings at RCGoy probled interaction and deep conductory habow 2 km ship by the ship of the fall of the same depth. In addition, UK acoustings at RCGoy probled interaction and deep conductory habow 2 km ship by the ship of the same depth. In addition, UK acoustings at RCGoy probled interaction and the same depth. In addition, UK acousting and the common destance of the same depth in the ship of the same depth. In addition, UK acousting and the common destance of the same depth in the ship of the same depth in

invence of a wertically inhomogeneous earth.

GONTRICS, VOL. AS, NO. 8

WHO Servalc methods

HIGUTION PIRSONANCE OF WINNER FICTERE

L. Sickel IARCO OIL and Gas Co., P.O. Cox 2819.

Likius, IX 152213 B. S. Marticos.

To improve for resolution oil selsmic events, one site designs a Wisser inverse filter that optimally in the least-squares names transforms a measured first signature than a spike. When this litter is spiled to refund data, the bandwidth oil may not selsmic data, the bandwidth oil and not selsmic that is greated increases along with the bandwidth oil by signal. Thus the signal-to-moleo ratio is degraded. It reduces along with the bandwidth oil resolute Wilmer filter. Prowhitening the filter may not selve a signal subliquity in the common practice relativists as the output signal-to-mobile that not the Wilmer filter. Prowhitening the filter may not the wilmer filter. Prove method the stillers of common practice is detarmined by the resolution time ranset is detarmined by the resolution time ranset the resolution time constant becomes the retigenal of resolving power recently described by illuse (19811. For mated allier, Por unfiltered systems the resolution time constant becomes the resilier to the resolution size constant becomes the resilier of signal power recently described by illuse (19811. For mated allier of signal and invaries of the Iraquesty apar of the signal. Altocogh it is militying that the resolution size constant delinition is second size of the invaries with other measures of resolution, chis more interestable incleases are neglected as the notes in seculty searchised filter. For these wavelets a point of distribution of the macrobed filter, Karlas selsmic sarches filter. For these wavelets a point of distribution must be macrobed filter, that the to a matched filter. For these wavelets a point of distribution is the macrobed filter, that the to a matched filter. For these wavelets a point of distribution is the macrobed filter that the to a matched filter. Sould be refused in a seco

all the rules of the first state of the stat

Appendices it is shown that three-diseasional election waters, cylindrical R-SV waves, acoustic waves, and illivargantic waves to increoped tayared media too liticoagnatic waves to increoped tayared media too liticoagnatic waves to increoped tayared media too lityrates.

The symmetry properties of the system matrix are used of system altrix of a significal supposed the system matrix are used frequency as altrix for a stock of indexognations in years.

The symmetry properties of the system matrix are used frequency as altrix for a stock of indexognation with the account in the system and the open stock of increoped and in some of a conventional enhancement of the system matrix. This wave if the system matrix is a large that it is a stock of the system matrix. This wave if the system matrix is a system was a system of the system matrix. One of these conventions is an antity reveal as a start was the system as a system and the open system is a system as a

is attack of Inhomographone Taytra bounded shows by fre markes, modified reflection and transmission

matrices are defined. Using the two propagation invariants, a number of symmetry properties of the modified reflection and transmission matrices are derived. For iosaisss media a generalized Sunets equation is given. The addified reflection and transmission matrices are approached in terms of the manufacture are approached in terms of the particlemed submatrices of the propagator matrix and in terms of the usual reflection and transmission matrices.

I also derive the response of a buried point source for a layered medium hounded by a lines surface and a homogeneous half-space, and for a layered medium hounded by two homogensous half-space, and for a layered medium hounded by two homogeneous half-space, and for a layered medium waves the Weyl threefall of a spherical wave into plane waves the Weyl threefall of a spherical wave into plane waves the Weyl threefall into cylindrical waves the Weyl threefall into cylindrical waves the Weyl threefall into cylindrical waves in the factors part is approached by two homogeneous are svenestant waves. The Whitzaker integral for spherical waves does not spear to be shown.

The decomposition into upgoing and Joungoing aves breash down (or horizontally treveling waves and surface waves. The reflection and transmission matrices do not exist in this case. This fact is used to delive dispersion relations and transmission matrices do not exist in this case. This fact is used to delive dispersion relations and transmission metrices do not exist in this case. This fact is used to delive dispersion relations and transmission metrices do not exist in this case. This fact is used to delive dispersion relations and transmission metrices do not exist in this case. This fact is used to delive dispersion relations and transmission metrices do not exist in this case. This fact is used to delive dispersion relationships for channel waves and surface waves. The reflection and transmission metrices do not exist in this case. This fact is used to delive dispersion relationships for channel wa

Geodesy and Gravity

3715 Chamical composition and chemical interactions
of FFALL CHEMISTRY STUDIES AROUND A LARGE COAL-FIRED
POWER PLANT IN THE SOUTHEASTERN BHITTO STATES
A. A. N. Patrines throughten Gational Laboratory.
Byton, Sew York 119731 H. Terry done and R. t.
Saylor
A worfall chemistry study was conducted within a
15-way radius of a large coal-tired power plant in the
southeastern Heited States. The study was conducted
during the winter of 1981 and included event presignification sampling on a dense network of 18 stational
soluction are clumetry monitoring at the sites and
automative method ogical resourcements the presipitation samples were analyzed for all major inorganic
tonic species including disavived sulfar disabled like
mecorrological included a pre-assisting network
of 49 recording raineages and four surface endagency
to 149 recording raineages and lover surface endagency
to 149 recording raineages and lover surface endagency
to 15 be results from five of the mappled according to the original
to be predoclared in our target or as samples and
sulfur, hydrogen low, and chierdae in over- lound to
be the predoclared plume-related species. Concentrarives in the affected regions exceeded the tectprount
levels b, up to 100% in the case of chierdae, in
the stores were characterized by excess disactived
30, amounts an the target camples; for these stores
ackvenging model simulations of disactive 50, concentrarions indicated that deposition of suffur by 50, excessing
within 12 be uses probably less them 13 of the total
emitted. Asset on the seasons of the forture of the source affects the
emitted. Asset on the seasons of clumber is not
conventional gas scaveaging theory appears reasonable.

I. Geophya. Res

J. Geophys. Res., Gtess, Paper 308914

If the the resolution time constant becomes the discretal of resolving power recently described by Jame (1961). For matcode Ilicor signals the naiveless class constant can be regeteded as the inverse it in treguency rups of the signal. Altought it is naiving the the resolution size constant delinition gives with other unsures of resolution, this more introduction size and the resolution size constant delinition gives with other unsurers of resolution, this more introduction size was a sure of the second of the comparison that it is easily generalized to incorporate the effects of noise by stands there of filter in a Wiener filter.

For a glves expect the filter in a Wiener filter is a Stardlist of the surgest of past opportunities and themselves the resolution of a Wiener filter that the two to a succeed silver to be resolution, a large intense is post of faintisting esture for reached, such that, to casting simply apparent or at the output.

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1765 Surface wares, tides, and see Tevel PREQUENCY ARALYSIS OF WAVE RESULTS BASED ON WAVE EXYELOPE

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THE VARIATION WITE PROUBERY OF THE LONG-PEPIOD TIOSS

J. A. Carton [Center (or testh and Fluestery Physics, Harvard University, Cambridge, Mass., O21]8]

The ocasalt response to lang-period tidal furcing in closed basins approaches equilibrium (or porteds such longer than a month, for anderage vatues of dissipation. At a given irequency the tesponse is closest to equilibrium nest the eastern wall of the basin. Global calculations of the fif and 25 tijes using a 25 x 2 grid are presented. Changes in the langth of day have also been computed for thems tides. Home-paried clides, hardropic motion1.

J. Geobes, Pas., tross. fame: 10981 J. Geophys. Pes., trees, faper 100981

1199 Orderal (Eubble Persistance)
THE PERSISTENCE OF AIP NUMBERS AT A DEAWATES DUMFACE
Scott R. Furger and funcan C. Stancharl (Atecepheric
Sciences Research Center, State University of New Lork at Alteny, Alleny, 'NY 1.222)
The time on air tubble poresists at a secondor

The time an air building is related at a solvator surface is a function of ray factors, including the relative hamidity and speed of the nir over the surface of the water. We find that hubble surface this increases in rapshilate with decreasing building and increasing speed of the nir. This appears to be conserved an antimity gradient along the rubble cap. This produces a curface trainer gradient (tarappost effect) that increases build number ille.

Company Sec. Report 100013 J. Geophys. Res., Paper 100915

Particles and Fields— Ionosphere

5505 Alrgiov TIPCTRON-IMFACI OF OI 1798 & MULTIPLEI
P. W. Erdum Imepartment of Physics and Astronomy,
University of fittsburgh, Pictsburgh, PA 13160] and I

We have investigated the dissociative excitation of the atomic oxygen multiplet 0(13s² 10⁶ · p) h; (1400 h) due to electron impact on 0; and [0]. With 0; as a target, no lious of this multiplet could be identified with a cross section greater than 2.4 · 10²⁴ · m² at 100 at. Similar results were obtained for the wetter-tion of 80, yielding an upper finit cross section of 1.1 · 10²⁴ · co². These reducts are consistent with a 17900/1899 branching ratio of 12.5 · 10²⁴ which is at least an order of congulated scalar than either the provious experimental upper limits or a recent theoretical calculation. This linding couplinates the study of 18¹⁶ 10²⁴ · 29¹⁶ p; 1899 A radiation entrapoent in the thermosphere and increases the potential importance of adjective absorption of the 1899 S unitable to Ng. Although the latter process cay help to explain some appears of the behavior of 1790 A emission in autores, it is nonetheless difficult, in the light of the present results, to account for the observed absolute intensity of this infrared cacade creamation using current entrapeace models. [airglow, atomic cavosm.

James, and rest, name, happer tailed:

5520 Electric Lields
THE DEPENDENCE OF THE RELATIVE BACYSCATTES CROSS
SECTION OF 16-BENSITY FLUCTUATIONS IN THE AURORAL ELECTRO-JET ON THE ANGLE OCTIVEES ELECTRON DRIFT AND RADAR MAVE

SECTION OF is-DEMNITY FUCTUATIONS IN THE ACCOUNT. EXECUTION OR SET AND RABAR MAYER VECTOR OR AND A MAYER SELECTRON OR SET AND RABAR MAYER PAGE 18 AND AND A MICH THAN STARK Eader system it is possible to measure, with high special and temporal temolution, the electron drift welcity, Vo. and the relation amplitude of electron dreads of the condity fluctuations of its wavelength in the suretain electron drift welcity, Vo. and the relation are generated by the the combined elicate of the two-stream and the gradient diff instability. We have determined the engular dependence of the hackworter lorensity (which is proportional to the square of she amplitude of the demnity fluctuations) on the maje of herves the electron drift direction and the direction from the startering volume to the radar in the plean perpendicular to the sugment field. We find a fluctuation minimum for H = OO and an increase cowards E = OO over the whole relocity reage up to 1000 and 3. This instream is easil for ventricine below the low accessit velocity. Co, but resthes over 20 dB galo is the hackwortse intensity (corresponding to a dennity fluctuations more then 10 times as great) for higher velocities. We explain the backwortset on be caused easily by two-arterna lostability in the tamps cose > Cg/Vg, and by secondary gradient drift inschility alternature. (places instabilities, radat aerors, electric fleids) J. Geophys. Rea., Slue, Yapar 3A0500 J. Geophys. Res., Slue, Taper 1A0900

5330 Eigh-letitode lonospheria suvrente
SHERGY GISSIPAYION RAYES IN THE POLAR IOSOSPHERE
5.-E. Ahn (Goophysiss) foreittete, University of
Alasha, Fairhanke, Alashe, Y701), A.-i. Akssotu and
Y. Kamide
As a part of the Jeint effects of operating size
and idian thaiss of asymptometers during the INS,
magnetic records from 11 strilous arm send to deduce
the distribution of electric fifide and corrents in
the distribution of electric fifide and corrents in
the operiod of this project, we have constructed
hourly distribution camps of the isoule hear production
rate, the particle easign ignition rate and their ess
over the entire polar region on the three days. Fac
this yorpose the conductivity distribution to inferent
at each instant particlity on the haule of an empirical this yorpose the conductivity distribution is a semivical mathed devised by Ano at al. (1982). The particle mathed devised by Ano at al. (1982). The particle seminary injectices rate is estiented elimity saing an empiriosi section. The data set thus charised allows us to estimate also the globel Jonis best production rate 0,, the global particle success linguistros rate U, and the own 0, of the two questicism. It found that the three global questicism that the three global questicism to a found that the three global questicism to a realist a truet linearly to the Akigni and Akigni indices. Our present estimates give the fallouing relationships:

a = 2.1 x 10° · AF, Q = 0.6 x 10° · AF and U, = 1.9

a 10° · AF, 0, - S.0 x 10° · AF. U, - 0.5 x 10° · AF and U, = 1.9

a 10° · AF, 0, - S.0 x 10° · AF. (Vala bett, Felar Tounsphate).

L Georgies 1. Georgies 1. Georgies 1. Georgies 1.

J. Gasphye. Res., Plan, Paper 3A0531

OSSERVATION AND MODELLING OF MULTI-PREQUENCY VMF and ONE SCHTTLLATIONS IS THE EQUATORIAL REGION.

3. J. PYRODE (Department of Kinntrical Engineering, University of Illinois at Unbest-Champaign, Urbess, Illinois, at Urbess-Champaign, Urbess, Illinois, ion

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ALTITUDE AND STRUCTURE OF AN AUPORAL ARC ACCELERATION RECICA

G. Paschmann (Raz-Planck-institut Tur extracerrestrische Physis, 8016 Gatching, N-Germany), J. Paparasionalis, N. Schople, G. Nacerndel, E.G. Shelloy During a notical Hight is the dayside automal oval on 17 December 1974, soveral examples of velocity discressions of puecipilating electrons near observed. It is shown that the commonly trajegyed interpretation of such dispersions of sesuiting from a porely Temporal modulation of the source is not unique: the same dispersion effects can also be couved by a rowing source of Histanish and constant intensity. This spetial model is further increwed by adding the dispersion originating from a superingosed convection volocity. In quaeral the source alfitudes implied by the two models benomenal and spatial) differ, for man of the cents analyzed the temporal model yielded a source altitude of -3000 km. Recause of special circumstances this did not differ significantly lives the result obtained with the spatial model. The second case nearlyzed was inconsistent with the temporal model and impulsed lumither rodification of the spitial model to include as energy dependent source width, in time with expectations from an acceleration in a V-shaped electric field paffern. Replying the latter model we derive a source altitude of - 3500 to - 4000 tm. J. Langehous Rev., Sime, Paper 1997.

Statistics and acceptances. The compaction of circulation into spiral places and support the compaction, or circulation into spiral places and support for the compaction of circulation into spiral places. And support for the compaction of the compact of the compaction of the compact of the com

J. Geophys. Ros., blue, Paper 540391

5568 Flagge cotton, convection or circulation 10%-PEDERSIN SELFT AND PARALLEL ELECTRIC FIELD EFFECTS ON PLANTA JETTING

J. L. Berling (JAYCOR, P.O. Box Ebija, San Diege,
California, 9211F)

The combination of ion-Faderson currents and parallel
electric fields are shown to significantly affect both The Commission of ten-raddress currents and parallel electric fields are shown to significantly affect both the jetting of immespheric places clouds transverse to the geomageric iteld and the Affects waves generated by the could plasma. Ion-raddress currents and parallel electric liside invalidate the "frozente" Nield appropriation and causs Alfven waves to decay. They also laply an elgenvalue condition on the size of the plasma cloud eraseverse to the geomagnetic lisid and the direction of cloud motion. The attenuation of Aliven waves roduces the libelihood that the waves can take an electroscapitic pulse on the ground and toplies that the infield directed energy in the plasma is the soupled, over great distances, re lone and electroscapitic that the infield directed energy in the plasma is the coupled, over great distances, re lone and electroscapitic force at higher alcitudes is g., 2 500 kml, where neutral and substancial displacement of plasma cloude with an acton panying comporary change in the geomagnetic field. Second, the Aliven wasse created is response to the section of plasma cloude vich an acton parallel second, the Aliven wasse created is response to the section of plasma cloude vich an acton parallel second, the Aliven wasse created is response to the section of plasma cloude vich an acton parallel second.

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3363 Plasma corlam, tonvection, or airculation a compagative Stidy of VHY SYINTIFLATION AND SPREAD F EVENTS OVER NATAL AND FORVALEZA IN BEAZLE R. T. de Hedelros (Universidade Yederol do Rio Grande do Morte, 59000 - Netal, RN, Brasil). N. A. Abdu ast

A comparative study is catried out of the equatorial immospherio irregularity occurrence, as observed by range spead F events over Fortaleze 16°8, 38°4, dipletigude 1.8°1 and satellite wif signal asistilitation owns over Satel (5.8°3, 11.3°4, diplatitude 4.8°5) for a one-year pariod, 1978. Close association is observed in the occurrences and the derations of the irregularities at the even stations. Marked differences in the scassomal behaviour of the occurrences of the irregularity events over these two stations are orded with cospect to that over llumnays, most important of them helps, that white the latter station personne equipmental marked to the latter station personne equipmental marked to the occurrences rates (as over some African stations), the freshilm estations show an additional and pronunced peak in Dacesbee. This teault is espialed on peasible avidence of naguetic declination control of the spined T irregularity generation and its seasonal dependance. The present results darlination coatrol of the spinal Firequierity generation and its measural dependence. The promont results have important implications also on the cocaletours of different irrequiatity scale sizes daring equatorial pineum hubble irregularity events. Léptend F. scintillistics, suspend varigitions, magnetic decliusation coateol).

J. Leophya. Pes., Sluw, Yaper 140730

5190 Conserts (ray tracing) INVERPRETATION OF IGNOCRAMS IN THE VITETTY OF THE DATERRETATION OF IDMANAGE IN AME VALUE OF BAYSIDE OVAL BY BAY TRACING Y. Hage (Mar-Planck-Eastitut (Gr Astosouta, p-301) Ketleoburg-Lindee, Stat Cormany), and E.

y. song (man-tanger-lindae, beat Cormany), and P. Sugarrap
A say kracing program hased on the Haslegrave squations has been developed and used to synthesiae event from the program. We have analysed fomograms taken in summer periods in the viciatry at the developed survei event. Empericity the oblique reflection transe on high intitude Sonograms from a field attigued attention density enhancement have been Etwinds. Esp mithe in the engatio marriaction with acopyrate and observed tonograms. The cay tracing exercise shows 5t is possible to east-easy characteristics of Fluid attigued electron density enhancement from charaved inpagrams. By earlying the parameters in the model of the Sono-sphere it is possible to easy a later could be a feature of the deformal each like the field eligand current sheet; in the samp region. (longeas, empre) rough, field eligand description. (longeas, empre) rough, field eligand descriptions dealty each enter of each deformal each like alectron density enhancement that could be a feature of the deformal each like alectron density enhancement and enter of each grant and a feature of the deformal each like alectron density enhancement.

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